

Claims

1. A catalyst for hydrotreating a hydrocarbon oil, which comprises an inorganic oxide support containing a phosphorus oxide in an amount of 15% by weight or less on the basis of the support and having provided thereon:

at least one selected from metals in the Group 6 of the periodic table in an amount of from 10 to 40% by weight,

at least one selected from metals in the Group 8 of the periodic table in an amount of from 1 to 15% by weight, and

carbon in an amount of from 2 to 14% by weight, in terms of respective oxides on the basis of the catalyst,

wherein the catalyst has a specific surface area of from 100 to 400 m²/g, a pore volume of from 0.2 to 0.6 ml/g, and a mean pore diameter of from 50 to 200Å.

2. The catalyst for a hydrotreating hydrocarbon oil according to claim 1, wherein a ratio by weight between the metal in the Group 8 of the periodic table and the metal in the Group 6 of the periodic table as a value of [metal in the Group 8]/[(metal in the Group 8) + (metal in the Group 6)] is from 0.1 to 0.25 in terms of

respective oxides.

3. The catalyst for hydrotreating a hydrocarbon oil according to claim 1 or 2, wherein, when a line analysis in the crosswise direction of cross-section through the center using an electron probe microanalysis (EPMA) apparatus, a phosphorus atom distribution satisfies the following equation (1):

$$S = \exp(0.04 \times I_{ave} + 0.013 \times I_{max} - 0.014 \times I_{min}) \leq 5.0 \quad (1)$$

wherein I_{max} is a maximum value of the measured value of the concentration of the phosphorus atom by EPMA line analysis, I_{min} is a minimum value of the measured value of the concentration of the phosphorus atom by EPMA line analysis, and I_{ave} is an average value of the measured value of the concentration of the phosphorus atom by EPMA line analysis.

4. A process for producing the catalyst for hydrotreating a hydrocarbon oil according to any one of claims 1 to 3, which comprises supporting a metal in the Group 6 of the periodic table so as to be at from 10 to 40% by weight, a metal in the Group 8 of the periodic table so as to be at from 1 to 15% by weight in terms of

respective oxides, and carbon so as to be at from 2 to 14% by weight on the basis of the catalyst, using a solution containing a compound containing at least one selected from metals in the Group 8 of the periodic table, a compound containing at least one selected from metals in the Group 6 of the periodic table, and an organic acid, on an inorganic oxide support containing a phosphorus oxide at 15% by weight or less on the basis of the support which has a specific surface area of from 230 to 500 m²/g, a pore volume of from 0.5 to 1 ml/g, and an mean pore diameter of from 40 to 180Å, followed by drying at 200°C or lower.

5. The process for producing the catalyst for hydrotreating a hydrocarbon oil according to claim 4, wherein the above inorganic oxide support containing a phosphorus oxide is prepared by a kneading method of kneading a starting material of the inorganic oxide support and a starting material of the phosphorus oxide.

6. The process for producing the catalyst for hydrotreating a hydrocarbon oil according to claim 4 or 5, wherein the above inorganic oxide support containing a phosphorus oxide is prepared by calcining at from 400°C to 700°C for from 0.5 to 10 hours.

7. A method for hydrotreating a hydrocarbon oil, wherein a catalytic reaction is carried out at a hydrogen partial pressure of from 0.7 to 8 MPa, a temperature of from 220 to 420°C, a liquid hourly space velocity of from 0.3 to 10 hr⁻¹ in the presence of the catalyst for hydrotreating a hydrocarbon oil according to any one of claims 1 to 3.